GEOLOGY AND PALEONTOLOGY.

Geology of Alaska.—In a report on the Coal and Lignite of Alaska Dr. Dall publishes some general notes on the Cenozoic geology of the Territory. In general, the sequence of rocks along the southeastern coast where undisturbed is about as follows, in descending order:

"1. Soil and Pleistocene beds."

"2. Brown Miocene sandstones, with marine shells, cetacean bones, and water-worn, teredo-bored fossil wood (Astoria group, Nulato sandstones, Crepidula bed)."

"3. Beds of conglomerate, brown and iron-stained, alternating with gravelly and sandy layers, the finer beds containing fossil leaves of Sequoia and other vegetable remains. (Kenai group, Nuga beds)."

"4. Bluish sandy slates and shales, with rich plant flora, interstratified with beds of indurated gravel, fossil wood, and lignitic coal (Kenai group)."

"5. Metamorphic quartzites and slaty rocks, with perhaps part of the lower Eocene (Tejon)."

"6. Granite and syenite in massive beds, usually without mica and apparently in most instances forming the "back bone" of the mountain ridges or islands, but occasionally occurring as instrusive masses, which have thrust up the metamorphic rocks above them into arches, cracking them, and filling the fissures with the syenitic material. ("Sumagin granite)."

The author correlates the Kenai group with the Oligocene of European geologists. The beds overlying the Kenai conglomerates and leaf beds are undoubtedly Miocene. Mr. Dall concludes from a comparison of their fauna with modern forms that in Miocene times the waters of this region were warmer than at present.

The Pleistocene epoch is marked in Alaska, as in California, by great changes of level, and by volcanic activity. To this period is assigned the ground ice formation which has been recognized in many places in the northern part of Alaska. This consists of solid beds of ice of considerable thickness, functioning as rock strata, which are covered by beds of blue clay containing remains of Pleistocene mammals, or by beds of alluvium which sustain a layer of turf, with ordinary profuse herbage of the region, or even small thickets of birch, alder, and other small Arctic trees.

The paleontology of the Territory is made the subject of special papers by Knowlton, Schuchert, and Hyatt which appear as appendices to Dr. Dall's report. The fossil flora embraces 115 forms, the most of which appear to be of Eocene or Oliogocene age. Mr. Knowlton concludes from a comparison of the Alaskan fossil flora with that of Greenland Spitzbergen and the island of Sakhalin that they are all so closely related that they probably grew under similar conditions and were synchronously deposited.

Faunal collections from Alaska are meager. As yet a few forms only, representing Silurian, Devonian, Carboniferous and Mesozoic beds, are known. According to Hyatt, the existence of the Cretaceous has not yet been demonstrated in Alaska, unless the Ancellæ described by Eichwald are Cretacic species. (Seventeenth Ann. Rept. U. S. Geol. Survey Pt. I, Washington, 1896.)

Phylogeny of Dæmonelix.—The strange fossil, popularly known as Devil's Corkscrew, has been of interest since its first discovery in 1891. During a recent expedition to the Loup Fork Tertiary Mr. E. H. Barbour made a study of these fossils *in situ* where a succession of them were exposed in a canyon. In passing from the lower beds to the higher forms varying from simplicity and uniformity to those of ever-increasing diversity and complexity are found, the climax being reached in the topmost beds. The simplest form of the Dæmonelix series is a hollow tubule or fiber, and the author's belief is that it is according to the arrangement or aggregation of these fibers that the multifarious forms result.

The second form, for lack of a better name, is termed "Dæmonelix Cakes." They are commonly circular in form, 5 to 10 centimeters across, and form ½ to 2 centimeters thick. They lie in horizontal planes through a vertical range of some six to eight meters. Overlying these were "balls," very similar to the preceding forms, but smaller in circumference and of greater complexity structurally.

The third form resembles cigars or fingers. In outward appearance they have acquired a pronounced vertical habit and a noticeable tendency to a spiral form. They are about the size of an ordinary cane. These are succeeded by an irregular spiral form, found through a vertical range of six to eight meters in the middle beds. This form, as well as the preceding, ends in blunt rounded terminations sealed or capped with fibers, leaving neither exit or entrance for supposed occupants of so-called burrows. Lastly we have the "Dæmonelix regular." A sheer wall exposes to view a section 40 to 45 meters from

bottom to top, with innumerable twisters at every level. Those at the bottom are constructed upon smaller and more uniform lines and stand in bold contrast to the large and diversified forms at the top.

Microscopic sections from all the five forms to the number of 120 demonstrate the fact that there is an apparent similarity of tissue in all and that it is cellular, but not vascular. Mr. Barbour's conclusions relate only to the first three forms and the surface structure of the great cork screws. The central spiral tube is under consideration. He suggests that it may represent the root of some higher plant about which the original Dæmonelix fibers grew. (Bull. Geol. Soc. Amer., Vol. 8, 1897.)

The Nature, Structure and Phylogeny of Dæmonelix.[1]— Prof. Barbour brings forth in this, his latest paper on the peculiar fossil popularly known in the region where it is found as the "Devil's corkscrew," additional evidence to support his already well supported conclusion that the fossil is that of an aquatic plant. The figures that he gives of sections showing plant parenchymatous cells in cross and in longitudinal section are much superior to any that he has previously published. The evidence that they form, together with the evidence of slides sent the writer, is conclusive. The fossil was a plant and is not the mould of the roots of some plant.

But in this and in a preceding paper[2] Prof. Barbour goes further than previously and cautiously claims to be able to make out the phylogeny of the fossil. At the bottom of the beds in which Dæmonelix occurs there are to be found irregular filamentous remains; above these, cake-like masses; above these, large irregular root-like forms that gradually metamorphose into regular screw-like forms. All present the same parenchymatous cellular structure when viewed in carefully made sections beneath the microscope. The author's idea is a bright, and it may be added, a daring one—daring in view of the tremendous change that is claimed to have taken place within the brief interval of geological time represented by the 250 to 300 feet of sediment forming the fossil bed. According to ideas more or less generally accepted, if the writer mistakes not, the waters of the great pliocene lake in which these fossils flourished are supposed to have been comparatively heavily laden with sediment, and as the structure of the beds shows, that it

[1] E. H. Barbour, Bul. Geol. Soc. Amer., VIII, 305–14. Reprint from the author.

[2] History of the Discovery and Report of Progress in the study of Dæmonelix. University Studies, Lincoln, Nebraska, Jan., 1887., II, 81–125.

was deposited rapidly. The change from the filamentous fossils to the well formed Dæmonelix is as great, or greater perhaps, than the difference between a simple infusorian and a sponge, or as that between a simple Spirogyra and a Fucus. No where in the animal kingdom and nowhere else in the vegetable kingdom is there to be found paleontological evidence of so rapid a change.

Yet it must be admitted that, although the rapid change required weighs heavily against Barbour's suggestion, it does not form a conclusive argument. Both animals and plants are known to yield readily to surrounding physical conditions, and great and anomalous changes are known to occur at a single leap as it were in many of the cases that fall under what we commonly call monstrosities. Granting that the change indicated by the series that the author thinks he has demonstrated is a possible one, there remains the greater and more important task of showing the existence at the time that these fossils plants were growing of causes adequate to produce it. This done the author's hypothesis will be practically unassailable.

In as much as the plants were aquatic one would not, judging from the analogy of aquatic organisms in other instances, expect so rapid a change as in the case of land plants. Climatic conditions could doubtless have had but little influence. One is, therefore, left to inquire what changes may have occurred in the character and the quantity of the salts that the water of the lake held in solution, or of the sediment that it carried. As the writer remembers the fossil beds in question there is no very apparent evidence of a change in the character of the sediment. The beds are not laminated. The structure from bottom to top is throughout remarkably and uniformly of the same peculiar mixture of fine, indurated, calcareous sand. And it seems, therefore, that, if any cause is to be found, it must be looked for in the character or amount of the salts that were poured into and remained in the lake. As yet no one has shown that the silicious material of which the fossils are composed is more abundant at one level in the beds than at another, and the same may be said of the magnesium, potassium and other salts.

Evidently there is much work yet to be done in solving this Dæmonelix riddle notwithstanding the great amount of labor that Prof. Barbour has already expended upon it, and it is to be hoped that he will find the necessary time and encouragement for continuing his work both in the field and in the laboratory. Besides an answer to the questions implied in the foregoing remarks there are needed answers to other questions regarding the structure of the fossil.—F. C. KENYON.

Origin of the Edentates.—Dr. Wortman has come into possession of material which, in his judgment demonstrates the genetic relationship of the Ganodonta to the later appearing American Edentata. In considering the Ganodonta the author points out the features which characterize the genera composing the family and which become more and more marked as the respective phyla advance into later time. These features relate to the loss of the incisors, the weak development and loss of the enamel, and the development of hypsodonty with its dependent modification growth from a persistent pulp. Of one phylum, viz. the Stylinodontidæ, Dr. Wortman has remarkably complete record, beginning in the generalized type Hemiganus of Lower Puerco, and continued into the Bridger, terminating in Stylinodon. In a comparison of this group with the Ground Sloths (Gravigrada) the author enumerates 17 points of resemblance which he considers sufficient evidence to demonstrate that the one has descended from the other. The next inference then is that all the South American Edentates must have been derived from the North American Ganodonta, since their earliest appearance in South America does not antedate the Santa Cruz epoch. But this necessitates a land bridge between North and South America during Eocene times, which is contrary to the accepted belief among geologists. In closing Mr. Wortman defines the order Edentata and its three suborders, Ganodonta, Xenarthra and Nomarthra with their families, and distinguishes the genera of the Ganodonta. (Bull. Amer. Mus. Nat. Hist., Vol. IX, 1897.)

Gypsum Deposits of Kansas.—The following information concerning the gypsum beds of Kansas was obtained by Mr. G. P. Grimsley during a field investigation of the region in which they occur:

"The gypsum beds of economic importance in Kansas are all Permian in age, ranging from middle Permian or Neosho to the close. They cover a belt approximately 200 miles long, 10 miles in width at the north, 20 miles in central Kansas, and 60 miles in the southern part of the state. The deposit is 8 feet thick in northern Kansas, 14 feet in the central area, 25 feet in the southern area, and even thicker further south. The northern and central rock gypsum was deposited in the same gulf cut off from the western Permian sea, while the gypseous dirt deposits are secondary and of recent age. The southern deposit was formed in a shallow bay cut off from the Permian sea, not far from the close of Permian time. Salt appears to have been deposited in these bays, but now it is only found farther out in the old gulf." (Bull. Geol. Soc. Amer., Vol. 8, 1897.)

Geology of the Funafuti Coral Reef.—The following summary is given by Mr. Hedley of the geological results of his observations while attached to the Funafuti Coral Reef Boring Expedition:

"(a) An elevation of Funafuti by at least 4 feet is proved by dead sub-fossil reef-corals in the position of life near high water-mark. (b) Darwin's theory of coral reefs, as opposed to Murray's, is favored by these facts: (1) Soundings show the atoll to be planted, not on a bank, but on a cone; (2) they also show it girdled by a precipitous submarine cliff, explicable only on the subsidence theory; (3) our observations and the experience of residents agree that the lagoon is filling up, whereas Murray demands its excavation, (c) A peripheral growth at present level is indicated on both sides of the islets." (Mem. III, 1897, Australian Museum.)

Geological News.—GENERAL.—Two kinds of mountain ranges are recognized by Dr. LeConte, classified by their generating forces. The one is anteclinal, the other monoclinal. As to cause the one is formed by lateral squeezing and strata-folding, the other by lateral stretching, fracturing, block-tilting, and unequal settling. As to place of birth, the one is born of marginal sea bottoms, the other is formed in the land crust. (Bull. Geol. Soc. Amer., Vol. 8, 1897.)

The fossil phyllopod genera, Dipeltis and Protocaris, according to Schuchert, are representatives of the Apodidæ family. The history of this family, therefore extends throughout the time of the entire known fossil-bearing rocks, as Protocaris occurs at the base of the Lower Cambrian. The fossil forms are generally marine, while all the recent species are denizens of fresh water ponds and pools. (Proceeds. U. S. Natl. Mus., Vol. XIX, 1897.)

PALEOZOIC.—In a revision of the fossil sponges found in the Quebec Group at Little Metis on the St. Lawrence River, Sir Wm. Dawson describes 14 species all belonging to the order Silicea. Of these, one, *Lasiothrix flabellata*, is new. Other animal remains from the same deposit are a small brachiopod, *Obolella pretiosa*, trails and castings of worms, and fragments of triobites, cystideans and Graptolites. (Trans. Roy. Soc. Canada, 1896–97.)

Some interesting vertebrate remains from the Kansas Permian are recorded by Williston, representing the genera Cricotus and Clepsydrops Cope. The characters do not warrant specific distinction from forms described by Cope from Danville, Illinois. The author calls attention to the close resemblance of the two series of forms and considers it a demonstration of the contemporaneity of the Illinois and

Kansas beds, as well as those of the Texas Permian, whence species of these genera have been described by Cope. (Kan. Univ. Quart., Vol. VI, 1897.)

MESOZOIC.—For the full classification of the Cycadaceæ Dr. Lester Ward proposes to use that term to represent the entire family, both living and fossil, and to subdivide it into the two subfamilies, the Cycadeæ for the living forms and the Cycadeoideæ for the fossil forms. Dr. Ward adopts this form of classification in his descriptions of species of fossil Cycads from the iron ore belt, Potomac formation of Maryland. In this collection seven species are recognized, of which six are new. (Proceeds. Biol. Soc., Washington, Vol. XI, 1897.)

The Museum at Caen, France is in possession of four reptiles from the Jurassic deposits of Normandy. These are identified by M. Bigot as *Steneosaurus roissyi* E. Desl., *S. intermedius* (n. sp.), *S. hebertii* Morel de Glasville and *Suchodus durobrivensis* Lydekker. All the specimens are fully described, and the new species figured. (Bull. Soc. Geol. de Normandie, t. XVII, 1896.)

The University of Denver has come into possession of a fossil Mosasaurid found near Flagler, Colo. It is interesting from the fact that there has been but one other Mosasaurid found in Colorado and also from the fact that it seems to be a new species.

It was thought, until within a year, that the Mosasaurids did not inhabit the ancient seas of Colorado, but existed only further toward the east. A few months ago, some bones which were probably from a Mosasaurid were found near Canyon city. These and the bones which I have, prove that the reptiles lived in the seas of Colorado.

From all I am able to learn of the reptile, I must conclude that it is a new species. It is possibly of the genus Clidastes. The description of this genus corresponds fairly well, though there seems room for doubt. The absence of characteristic parts makes the identification uncertain.

The vertebral column is about five meters in length and is composed of ninety vertebræ. Some parts of the jaw and limbs are also preserved. The authorities at the National Museum, Washington, to whom I sent some of the bones, write that I "probably have one of the most complete vertebral columns of this group of marine reptiles (Clidastes) in existence. The tail is particularly fine and gives me a much better impression of the depth and compression of this part of the body."—W. T. LEE.

CENOZOIC.—The following is the history of Crater Lake, Oregon, as worked out by Mr. J. S. Diller.

During the early glacial period Crater Lake did not exist, its site being occupied by an active volcano, Mt. Mazama. During the final great eruption of this volcano its summit caved in giving rise to a caldera nearly six miles in diameter and four thousand feet deep. Upon the bottom of the caldera volcanic activity continued. There were new eruptions forming cinder cones and lava fields partially refilling the great pit. Volcanic activity ceasing, the conditions were favorable for water accumulation and Crater Lake was formed in the pit. (Amer. Journ. Sci., Vol. II, 1897.)

From a study of parts of Labrador and Baffin Land Mr. R. S. Tarr concludes that all of that region, except possibly, the highest parts, has been buried beneath an ice sheet and there is evidence that the ice has withdrawn from these regions in very recent times. Down cutting of the surface by glacial action is more marked in Labrador than in Baffin Land. Post-glacial weathering is very pronounced in both regions. (Amer. Geol., Vol, XIX, 1897.)

BOTANY.[1]

Botanical Society of America.—The Third Annual Meeting of the Society will be held in Toronto on Tuesday and Wednesday, August 17th and 18th, 1897, under the presidency of Dr. John M. Coulter. The Council will meet at 1 P. M. on Tuesday, and the first session of the Society will begin at 3 P. M. The address of the retiring President, Dr. Charles E. Bessey, will be given on Tuesday evening at 8 o'clock.

The British Association for the Advancement of Science will meet in Toronto, August 18th to 25th. The opening address is to be given on Wednesday evening, August 18th. Professor A. B. Macallum, President of the Local Executive Committee, writes:

"A great many of the members of the Botanical Section of the B. A. A. S. are booked to leave Liverpool August 5th. They will arrive in Quebec and Montreal, if they make the usual time, by the 14th and 15th respectively, and will be in Toronto on Tuesday evening (17th) at latest. Some may stay over at Montreal and Ottawa and possibly

[1] Edited by Prof. C. E. Bessey, University of Nebraska, Lincoln, Nebraska.